

I claim:

1. A draft gear assembly for absorbing buff and draft shocks encountered in a railroad rolling stock, said draft gear assembly comprising:

5 (a) a housing having a closed end and an open end opposing said closed end, said housing further having a rear portion adjacent said closed end and a front portion adjacent said open end, said rear portion having a bottom wall, said front portion being in open communication with said rear portion;

10 (b) a compressible cushioning element centrally disposed within said rear portion with one end thereof abutting at least a portion of an inner surface of said closed end of said housing, said compressible cushioning element extending longitudinally from said one end, said compressible cushioning  
15 element including a hydraulic cylinder and at least one cylinder spring disposed intermediate said cylinder and said bottom wall, said hydraulic cylinder including:

(i) a cylinder housing,

(ii) a piston including a piston head, said piston having  
20 an axial bore of a first predetermined diameter having a rear wall and an open end, an axial counter bore abutting said axial bore at said open end end, an axial cylinder guide of a second predetermined diameter concentric with said axial bore, said

axial cylinder guide abutting said axial bore at said rear wall end, said axial cylinder guide having a second cavity bored substantially perpendicular to said cylinder guide for connecting thereof with an outside of said piston, said second  
5 cavity for further relieving a pressure in said axial cylinder guide, said piston slidably disposed within said cylinder housing to establish a high pressure chamber and a low pressure chamber,

(iii) a flexible boot having one end fastened to said  
10 piston and having a second end fastened to a cap and boot adapter of said cylinder,

(iv) a rubber gasket mounted within said cap and boot adapter for sealing a space between said cap and boot adapter and said cylinder to prevent leakage,

15 (v) at least one fluid passage disposed within said piston for establishing a communication between said high pressure chamber and said low pressure chamber; said at least one fluid passage having flow restricting orifices disposed at one end adjacent said axial counter bore of said piston, said  
20 flow restricting orifices exposed to said high pressure chamber,

(vi) an expansion ring and a piston ring mounted within an annular groove formed within said piston head,

(vii) a first cavity coplanar with said annular groove of said piston head,

(viii) a pin disposed within said first cavity, said pin extending through said piston head, said pin having ends  
5 adjacent said expansion ring,

(ix) a variable orifice metering pin sideably disposed within said piston, said variable orifice metering pin having an inner surface and an outer surface, a stem element attached to said inner surface, said stem element having a working end of a  
10 predetermined length and of a third predetermined diameter of between .278 inches and .279 inches, said stem element slidable within said cylinder guide, at least one aperture disposed within said variable orifice metering pin for equalizing a fluid pressure between said high pressure chamber and said low  
15 pressure chamber of said piston, said variable orifice metering pin at least partially closing said flow restricting orifices with said variable orifice metering pin being in its full released position,

(x) a restricted bore extending from a surface of said  
20 piston head to said at least one fluid passage for insuring a rapid return of said variable orifice metering pin to its full release position,

(xi) a compression coil spring of a first predetermined spring rate disposed within said axial bore of said piston having one end abutting said rear wall of said axial bore and having the other end abutting said inner surface of said variable orifice metering pin, said compression coil spring biasing said variable orifice metering pin against said pin disposed within said first cavity, and

(xii) a shock absorbing capacity increasing means disposed within said piston for economical retrofitting of said draft gear assembly, said shock absorbing capacity increasing means for increasing a reaction fluid pressure in said low pressure chamber of said hydraulic cylinder, said shock absorbing capacity increasing means for further increasing a shock absorbing capacity of said draft gear assembly.

(c) a positioning means on said inner surface of said closed end of said housing for maintaining said one end of said hydraulic compressible cushioning element centrally positioned in said rear portion of said housing during compression and extension of said hydraulic compressible cushioning element;

(d) a seat means having at least a portion of one surface thereof abutting the opposite end of said hydraulic compressible cushioning element and mounted to move longitudinally within said housing for respectively compressing and releasing said

hydraulic compressible cushioning element during application and release of a force on said draft gear assembly;

(e) a friction cushioning means positioned at least partially within said front portion of said housing for  
5 absorbing energy during a compression of said draft gear assembly, said friction cushioning means including:

(i) a pair of laterally spaced outer stationary plates having an outer surface and an opposed inner friction surface, said outer surface engaging said housing, said pair of outer  
10 stationary plates having Brinell hardness of between about 429 and 495 throughout,

(ii) a pair of laterally spaced movable plates of substantially uniform thickness and having an outer friction surface and an inner friction surface and at least one  
15 substantially flat edge intermediate said outer friction and inner friction surfaces, said one edge engaging said seat means, at least a portion of said outer friction surface movably and frictionally engaging said inner friction surface of said outer stationary plate,

20 (iii) a pair of laterally spaced tapered plates having an outer friction and an inner friction surface, said outer friction surface movably and frictionally engaging at least a portion of said inner friction surface of said movable plate,

(iv) a pair of laterally spaced wedge shoes having at least a portion of an outer friction surface movably and frictionally engaging at least a portion of an inner friction surface of said tapered plate, and at least a portion of one edge engaging said  
5 seat means, said pair of wedge shoes having a predetermined tapered portion which is tapered upwardly and outwardly from a plane intersecting a longitudinal center line of said draft gear assembly at an angle of about 53 degrees on an opposed edge thereof, and

10 (v) a center wedge having a pair of matching predetermined tapered portions at an angle of about 53 degrees for engaging said tapered portion of said wedge shoe to initiate frictional engagement of said friction cushioning means and thereby absorb energy; and

15 (f) a spring release means engaging and longitudinally extending between said seat means and said center wedge for continuously urging said friction cushioning means outwardly from said compressible cushioning means to release said friction cushioning element when an applied force compressing said draft  
20 gear is removed.

2. A draft gear assembly, according to claim 1, wherein said draft gear assembly further includes at least one

cushioning spring encasing said hydraulic compressible cushioning element, said at least one cushioning spring abutting said bottom wall of said rear portion at one end, said at least one cushioning spring abutting said seat means at a distal end.

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3. A draft gear assembly, according to claim 1, wherein said housing further includes a built-up portion along two opposed sides adjacent said inner surface of said closed end and an inner surface of a connecting sidewall of said housing.

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4. A draft gear assembly, according to claim 1, wherein said at least one passage is a pair of fluid passages spaced diametrically opposite each other.

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5. A draft gear assembly, according to claim 1, wherein said at least one aperture is three apertures equally spaced about a longitudinal axis of said variable orifice metering pin.

20 6. A draft gear assembly, according to claim 1, wherein said shock absorbing capacity increasing means includes said working end of said stem element of said variable orifice metering pin having a forth predetermined diameter between .150 inches and .278 inches, said shock absorbing capacity increasing

means further including an insert disposed within said cylinder guide intermediate said rear wall at one end and said second cavity at a distal end, said insert having an outer diameter slightly larger than said second predetermined diameter of said axial cylinder guide and an inner diameter slightly larger than said forth predetermined diameter of said working end of said stem element for providing a predetermined clearance between said insert and said working end of between .002 inches and .004 inches.

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7. A draft gear assembly, according to claim 6, wherein said working end of said stem element of said variable orifice metering pin having a fifth predetermined diameter between .210 inches and .211 inches and said insert having an inner diameter slightly larger than said fifth predetermined diameter of said working end of said stem element for providing a predetermined clearance between said insert and said working end of between .002 inches and .004 inches.

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8. A draft gear assembly, according to claim 1, wherein said shock absorbing capacity increasing means includes said working end of said stem element of said variable orifice metering pin having a forth predetermined diameter between .150

inches and .278 inches, said shock absorbing capacity increasing means further includes a spacer disposed intermediate said rear wall of said axial bore and said compression coil spring, said spacer having an outer diameter slightly smaller than said first  
5 predetermined diameter of said axial bore and an inner diameter slightly larger than said forth predetermined diameter of said working end of said stem element for providing a predetermined clearance between said insert and said working end of between .002 inches and .004 inches.

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9. A draft gear assembly, according to claim 8, wherein said working end of said stem element of said variable orifice metering pin having a fifth predetermined diameter between .210 inches and .211 inches and said spacer having an inner diameter  
15 slightly larger than said fifth predetermined diameter of said working end of said stem element for providing a predetermined clearance between said insert and said working end of between .002 inches and .004 inches.

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10. A draft gear assembly, according to claim 1, wherein said shock absorbing capacity increasing means includes said variable orifice metering pin having a working end of a third predetermined diameter, said shock absorbing capacity increasing

means further including said compression coil spring having a second predetermined spring rate which is less than said first predetermined spring rate.

5        11. A draft gear assembly, according to claim 1, wherein said shock absorbing capacity increasing means includes said variable orifice metering pin having the forth predetermined diameter of the working end of the stem portion between .150 inches and .278 inches, said shock absorbing capacity increasing  
10 means further having said axial cylinder guide of a sixth predetermined diameter for providing said predetermined clearance between said cylinder guide and said working end of between .002 inches and .004 inches.

15        12. A draft gear assembly, according to claim 11, wherein said working end of said stem element of said variable orifice metering pin having a fifth predetermined diameter between .210 inches and .211 inches and said axial cylinder guide of a seventh predetermined diameter for providing a predetermined  
20 clearance between said insert and said working end of between .002 inches and .004 inches.